

The Case For A Large FOV Imager

Need to observe extended objects, such as:

- clusters of galaxies

- galaxies

- supernova remnants

- star clusters

The field of view is rather modest for the quantum calorimeter (2.5-5'), but we can get a larger field of view, with CCDs in the zero order image, without paying much of a price.

Here's an example of some science, likely to be relevant, that requires a decent FOV.

For a $\Omega_{\text{tot}} = 1$ cosmology, where $\Omega_{\Lambda} + \Omega_{\text{M}} = 1$
distances go as

$$d_L \propto (1+z)H_0 \int dz / (\Omega_{\text{M}} (1+z)^3 + \Omega_{\Lambda} (1+z)^{3(1+w)})^{1/2}$$

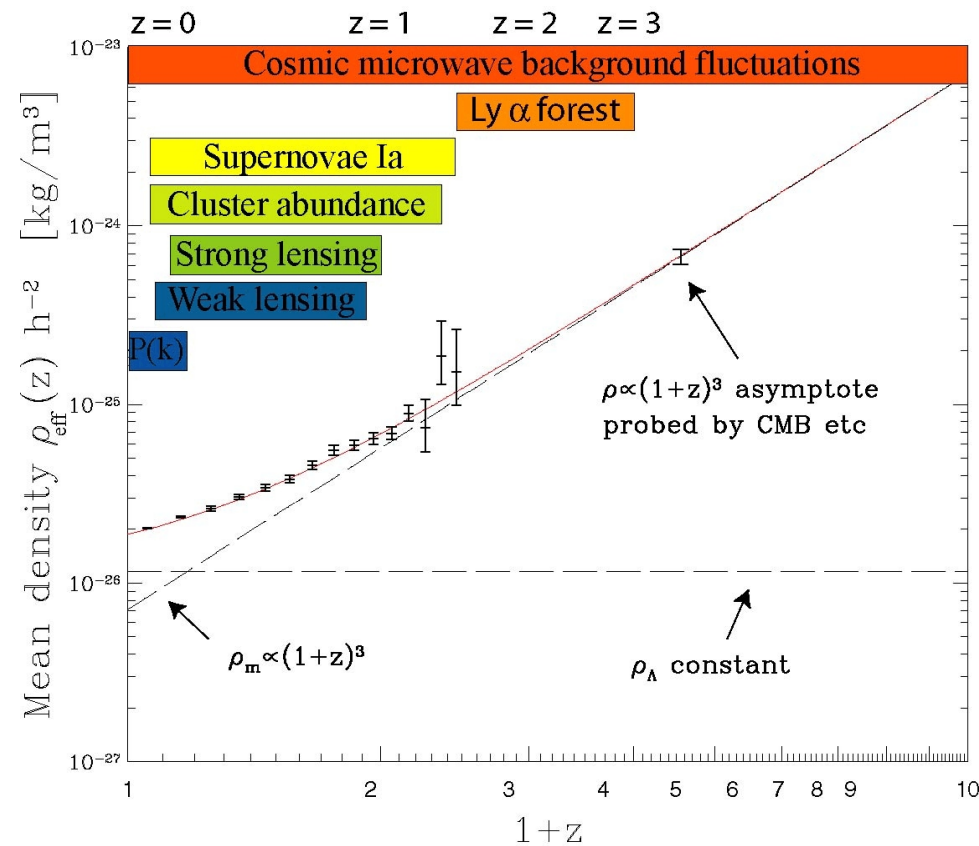
w is the quintessence parameter

We already know that $-1.5 < w < -0.5$,
although $w < -1$ doesn't make much sense,
so it's in the range $-1 < w < -0.5$, and
the 1σ values are more like $-1 < w < -0.8$
($w = -1$ is a Cosmological constant)

For example, for $w = -1$, $\Omega_M = 0.3$, $\Omega_\Lambda = 0.7$,
the denominator is dominated by Ω_Λ at $z = 0$
but by Ω_M at $z = 1$, where the denominator has the
argument $(2.4 + 0.7)^{1/2}$

(the two terms are equal at $z = 0.32$)

So if you want to find out something about w , all the action is in the $z = 0$ -1 region, with the $z \approx 0.5$ region being critical



In the X-ray region, people try to get a handle on cosmological parameters, like w in a few ways with clusters of galaxies:

- Volume evolution (number density with z)

- Constant baryon fraction in clusters ($d^{3/2}$)

- S-Z Effect

For a cluster of galaxies, you probably want to measure n_x and T_x out to 1 Mpc, but you should use a background beyond the tidal radius, typically 2-3 Mpc.

At $z = 0.5$, 1 Mpc is 3.3' (a radius; 7' diameter), so you need a diameter of 15' or more to get the cluster and the background.

This is 21' for $z = 0.25$ and 13' for $z = 0.75$.

Conclusion: It would be VERY helpful to have an instrument with a FOV of 20' or more.

A Proposal for a Large FOV Camera

- use the zero order image (currently 8' chip at this location)
- tile the image plane (to 30' or so)

Problem: this image will be very soft (1/4 keV)

Objects that emit soft X-rays

- stars (coronae)

- cooling compact objects (naked NS; WD)

- clusters of galaxies (at high redshift)

- early-type galaxies

- galaxy groups (the outer parts)

- Local bubble; Group; Galactic Halo

- AGNs (soft excess)

- ultrasoft sources

A further modification to the Zero-Order Image

- keep 20% of the gratings flat (just reflectors)
- improves the energy range of the image
- hardly any impact on the observing time for S/N of spectra

The gratings selected would need to have good image properties at the Zero-order image (on-axis gratings?)